REMEDIAL DESIGN WORK PLAN
LORD-SHOPE LANDFILL
SUPERFUND SITE

Prepared for:

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1.0 INTRODUCTION

1.1 PURPOSE

This Remedial Design (RD) Work Plan describes the work tasks necessary to design the Remedial Action at the Lord-Shope Landfill Superfund Site (the Site) located in Girard Township, Pennsylvania. The Work Plan includes the technical requirements of the June 29, 1990 Record of Decision (ROD) issued by USEPA and incorporates all design work elements and deliverables previously specified in the Statement of Work (SOW) attached to the Consent Decree entered into between Lord Corporation and the United States Government. The Consent Decree, SOW, ROD, the National Oil and Hazardous Substances Contingency Plan, 40 CFR Part 300 (the NCP), The Comprehensive Environmental Response, Compensation, and Liability Act, as amended, 42 U.S.C.Section 9601 et. seq. (CERCLA), this Work Plan, the "Superfund Remedial Design and Remedial Action Guidance" (OSWER Directive 9355.0-4A, June 1986) and any and all applicable USEPA guidelines shall be followed in designing the remedial action at the Site. In the event and to the extent that the provisions of this RD Work Plan conflict with any provision of the Consent Decree, SOW, or ROD, the provisions of the Consent Decree, SOW, and ROD shall control.

1.2 REQUIREMENTS

Section VI.B. of the Consent Decree requires Lord Corporation to submit to USEPA, within 14 days of the effective date of the Decree, a work plan for the design of the remedial action at the Site (Remedial Design Work Plan), a Quality Assurance Project Plan (QAPP), and a Health and Safety Plan for field design activities.

The Remedial Design Work Plan is to include plans, schedules, and methodologies for implementation of the necessary design and pre-design tasks identified in the SOW, including but not limited to: 1) a Remedial Design Permitting Requirements Plan; 2) a Remedial Design Contingency Plan; 3) work plans and schedules for the design and implementation of treatability studies; 4) plans and schedules for the preparation and submission of preliminary, pre-final, and final design submittals; 5) Treatability Study Construction Quality Assurance Project Plans; and 6) an expeditious schedule for completion of all components of the Remedial Design.

Certain of these requirements have already been satisfied by prior submittals. The remainder are provided herein. Listed below is a summary of the status of the requirements.

Requirement	Status
Quality Assurance Project Plan	Previously transmitted to USEPA
Health and Safety Plan	Previously transmitted to USEPA
Remedial Design Work Plan	This document
RD Permitting Requirements Plan	This document, Appendix B
RD Contingency Plan	Previously transmitted to USEPA
Work Plan for Groundwater Treatability Study	Previously transmitted to USEPA
Work Plan for In Situ Vapor Stripping Treatability Study	Previously transmitted to USEPA
Plans and Schedules for Design Submittals	This document, Section 4
Treatability Study Construction Quality Assurance Project Plans	This document, Appendix A
Schedule for Completion of Design	This document, Section 4

2.0 BACKGROUND INFORMATION

2.1 SITE LOCATION AND DESCRIPTION

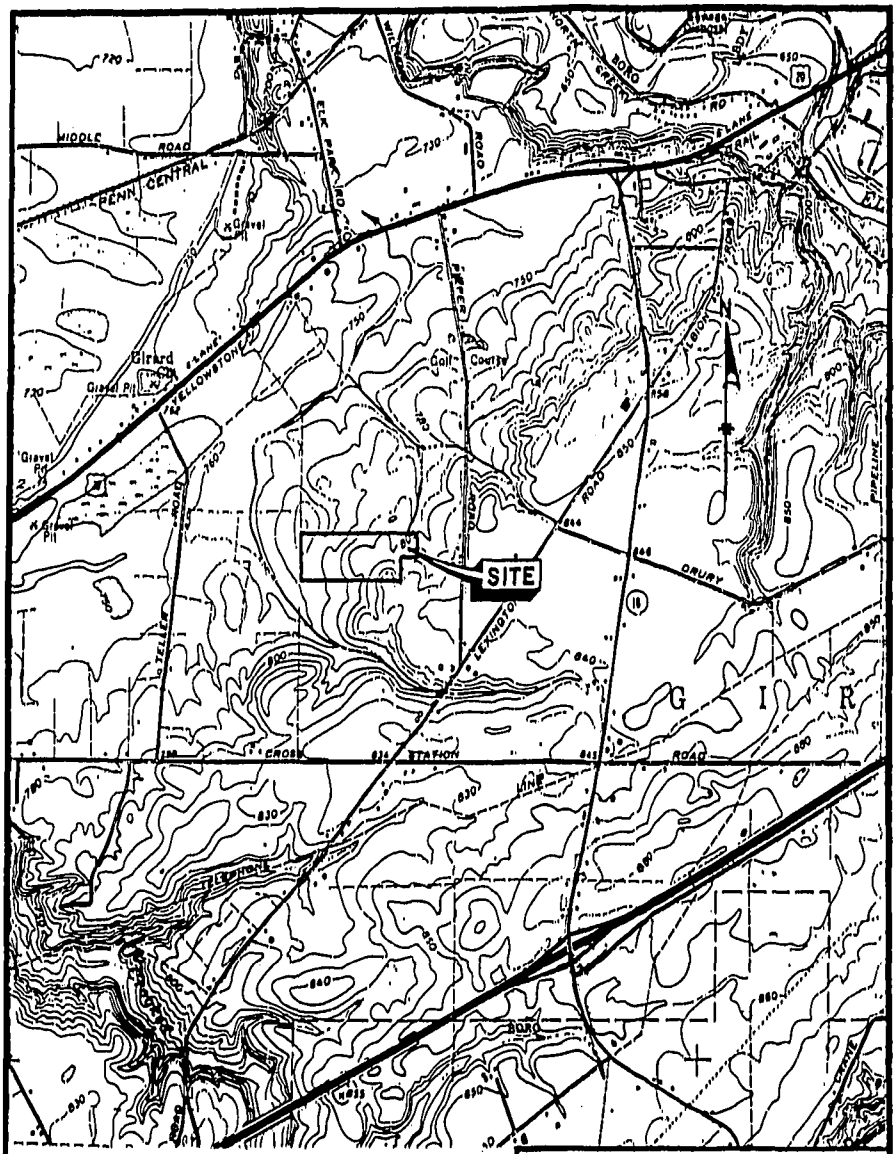
The Lord-Shope Site is located west of Pieper Road approximately 4,500 feet south of the intersection of U.S. Route 20 and Pieper Road in Girard Township, Erie County, Pennsylvania (see Figure 2-1). To the north of the site and to the west of the site are two unnamed tributaries of Elk Creek. The site consists of an inactive, industrial waste landfill covering approximately 4 acres, and the adjacent areas of contaminated groundwater. The property containing the landfill is presently owned by the Lord Corporation ("Lord") of Erie, Pennsylvania.

The landfill currently appears as a grass covered mound which rises approximately 20 feet at its highest point. The surrounding area is primarily rural agricultural with scattered residential areas bordering the roads. The property is bounded to the east by Pieper Road, an apple orchard and vineyard to the south, an evergreen nursery to the west, and an overgrown cornfield to the north. A golf course is located to the north of the landfill property, adjacent to the cornfield. The only nearby residences are located along Pieper Road to the east and along Route 20 to the north. The nearest population center, Girard Township, is located two miles to the northeast.

2.2 SITE HISTORY

From the mid-1950s until 1979, industrial wastes, including spent adhesives, solvents, cutting oils, acids and caustics, along with miscellaneous paper, wood, and rubber wastes, were disposed of at the site. Some wastes were disposed of in drums. The property was then owned by the late Mr. Melvin Shope, who was at that time an employee of Lord. The wastes originated at Lord's Erie (12th Street) and Saegertown plants.

In 1982, after Lord had conducted some preliminary site studies, Lord, Mr. Shope, and the Pennsylvania Department of Environmental Resources (DER) entered into a Consent Order and Agreement that called for continued monitoring and the implementation of a "remedial alternative" at the site. The remedial alternative, implemented in 1982 and 1983, consisted of the removal of approximately



SOURCE: ALBION, (1959, REV. 1969) PA. 7.5' QUADRANGLE

2000 0 2000
scale feet

MAP LOCATION

FIGURE 2-1

LOCATION MAP

SHOPE'S LANDFILL SITE
LORD CORP.
GIRARD TWP., PA.

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ECKENFELDER INC. Nashville, Tennessee Mahwah, New Jersey

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81 exposed drums of waste, emplacement of a composite cap over the landfill, the construction of a low permeability groundwater cutoff wall upgradient (south) of the landfill, and the regrading and revegetation of the site. The construction of the cap included a clay layer, a synthetic membrane, and a vegetative soil cover. The objective of that remedial alternative was to reduce the amount of contamination entering the groundwater by reducing leachate production in the landfill and diverting groundwater flow around the site.

Under provisions of CERCLA, the site was placed on the National Priorities List (NPL) in September 1983. The regulations enacted pursuant to CERCLA generally require that a Remedial Investigation and Feasibility Study (RI/FS) be conducted at each NPL site. The purpose of an RI is to characterize conditions at the site. The subsequent FS then develops, screens, and analyzes a series of remedial alternatives which are applicable to those site conditions and might be implemented at the site. The area studied in the Remedial Investigation for the Lord-Shope site included the landfill and plume area, the area immediately surrounding the site, the two tributaries and drainage patterns that make up the surface hydrology, and the groundwater system below these areas.

In order to supplement the existing site information and to meet the requirements of CERCLA, DER and the U.S. Environmental Protection Agency (USEPA) requested, in 1985, that Lord conduct a "focused" RI to characterize groundwater conditions and an FS at the site. In 1987, Lord's agreement to conduct the RI/FS was embodied in a Consent Order signed by DER and Lord. The RI was conducted and the RI report submitted by Lord's environmental consultant, AWARE Incorporated. Following evaluation of that report, it was decided that further investigations at the site were necessary. DER and USEPA requested that a "Phase II" RI and FS be conducted. This investigation was conducted for Lord by ECKENFELDER INC. (formerly AWARE Incorporated).

The RI and FS reports were approved by the agencies as complete in early 1990. USEPA published a proposed cleanup plan in March 1990, held a public meeting on the proposed plan in April 1990, and received, considered, and responded to public comments. The ROD was signed by the USEPA Regional Administrator on June 29, 1990.

In November 1990, Lord Corporation transmitted to USEPA a good faith proposal to conduct the Remedial Design/Remedial Action (RD/RA) at the Site. Shortly thereafter, legal and technical negotiations leading to a signed Consent Decree began. These discussions continued as new issues arose (e.g., potential wetlands, attainability of groundwater discharge limits). In June 1991, Lord Corporation signed the Consent Decree for the RD/RA. After the various signatures for the United States of America were completed, the document was forwarded to the U.S. District Court for the Western District of Pennsylvania and was lodged for public notice and comment. On October 2, 1991 Lord Corporation received an official copy of the Consent Decree, which had been entered on September 27, 1991. USEPA has stated that October 2, 1991 is the "effective date" of the Consent Decree.

2.3 SITE CONDITIONS

The nature and extent of site-related contamination around the landfill has been evaluated by a number of investigations; the most recent being the Phase II Remedial Investigation concluded in 1989. The investigations identified the contaminated or potentially contaminated media to be the landfill materials, groundwater, subsurface soils, and, to a limited extent, surficial soils.

2.3.1 Groundwater

A contaminant plume, consisting primarily of volatile organic compounds, has been identified to the north and northwest of the site. The contamination appears to be migrating primarily in the Intermediate Zone, but has also been demonstrated in some areas in the Water Table Zone. In general, the plume has migrated to the north and west approximately 150 to 600 feet; however, in an area directly north of the landfill a "plume extension" has migrated approximately 1,400 feet in an area shown to have a higher conductivity.

A group of halogenated and non-halogenated volatile organic compounds has been identified by the analytical protocols that are at present employed to analyze the site groundwater samples. This group includes primarily methyl isobutyl ketone (MIBK), 4-methyl-2-pentanol, acetone, methyl ethyl ketone (MEK), vinyl chloride, trans-1,2-dichloroethene, and terahydrofuran (THF). In addition to each of these compounds, the GC analytical methodology that was employed prior to 1988 had

identified cyclohexanone, 2-butanol, isopropanol, and tetrachloroethene. These compounds correspond well to the types of wastes known to have been disposed in the landfill. The various ketones are shown to be the predominant organic constituents.

The primary plume constituents at the Shopes site are volatile organic compounds. Inorganic compounds principally consisting of a group of metals and chloride have been noted in wells installed in the plume. Statistically significant levels of certain metals have been detected in the Water Table and Intermediate Zones. However, most of these metals are restricted to the wells located close to the landfill.

The Deep Zone has not shown evidence of any contamination. Residential wells in the area have also not shown any evidence of any contamination.

2.3.2 Surficial Soils

Surficial soil contamination has been identified in several areas around the landfill. Several of these areas correspond to the seep areas in which contaminated standing water has been observed. This is the case in areas immediately northeast, north, and southwest of the landfill. Laboratory analysis of samples taken immediately below the surface indicate that surficial soil contamination is highly localized and that it exists in low concentrations for volatile organic compounds.

The most significant area of surficial soil contamination is the landfill toe area. This area is located immediately southeast of the site. One possible explanation for contamination in this area is spillage from trucks entering the site at the time of landfill operation.

2.3.3 Deep Soils

A deep soil study focused on the landfill perimeter indicated that the most significant levels of contamination in soils, at depths ranging from 6 to 68 inches, occurred on the hill 70 feet southeast of the landfill. Contamination levels dropped to nearly non-detectable levels at a depth of 30 feet. The magnitude and penetration of soil contamination was not as extensive in the other borings. The

volatile constituents identified by the laboratory analyses of the deep soils are very similar to those for the surficial soils.

A second deep soil study was conducted above the plume extension in the area north of the landfill. The soils were not believed to be contaminated as a direct result of chemical leakage or spillage as are the soils on the landfill perimeter. Rather, the soil pores are believed to contain the contaminated groundwater of the plume extension. Contamination in the soil samples corresponds to the approximate location of the plume extension as determined by monitoring well sampling. As with the surficial soils and the deep soils of the landfill perimeter, contamination of the deep soils in the area of the plume extension is highly localized and exists at relatively low concentrations.

2.3.4 Other Environmental Media

Several of the other environmental media at or near the site were sampled during the RI project and during previous investigations. These media included surface waters and sediments from the stream tributaries, seep areas, drainage swales, standing water in low-lying areas, and ambient air. The significant conclusions of the RI regarding these other media are summarized below:

- No indications of landfill-derived organic compounds have been observed in sediments of the two small streams in the vicinity of the site. There is some evidence of elevated metals in the sediments of the small stream located north of the landfill.

- Small volumes of surface water containing volatile organics have been identified in the seep areas immediately adjacent to the site. However, no observable flow emanates from these wet areas.

- The ambient air quality at and adjacent to the landfill is not being affected by the site. All photoionizer detector readings indicated non-detectable or background levels of volatile organic compounds.

2.3.5 Environmental Impact of the Lord-Shope Landfill

Two Biological Investigations were conducted at the Lord-Shope Landfill and surrounding area during the course of the Remedial Investigation to evaluate the environmental impact caused by the site. Results of these studies of the aquatic biota indicate that, overall, the water is fair to excellent with a good number of species and numbers of individual organisms. In the process of collecting benthic samples numerous fathead minnows were observed and released. This was the only fish species observed with the exception of two small bluegills noted at one sample station.

There are no presently recognized wetlands in the vicinity of the unnamed tributary to the north of the landfill. There are some areas upstream of the Elk Creek tributary, to the south of the Site, that include some hardwood swamp environment. These areas are not on the National Wetlands Inventory and are upstream and considered to be outside the influence of the Site or planned Site activities.

There are no special or endangered species at the Site or in the area of the Elk Creek drainage basin. There is no evidence of impacts to biota in either tributary from activities at the landfill.

2.4 SUMMARY OF SITE RISKS

A Baseline Public Health Evaluation and a Biological Evaluation were performed at the Lord-Shope Landfill Site in accordance with guidelines established by USEPA for performance of such evaluations at Superfund sites. Indicator compounds were selected and associated risks were calculated for the different affected media and potential exposure routes at the site. The results of these studies were reported in detail in the Remedial Investigation Report.

Currently there is the possibility of human exposure through accidental ingestion of water from the seeps or accidental ingestion of contaminated soils or sediments at the site. Since the cap and vegetative cover were implemented in 1984, there has been no detection of volatile organic compounds in the breathing space. Consequently, the air pathway of exposure is considered insignificant.

The risks potentially associated with accidental ingestion of water from the seeps or accidental ingestion of soils/sediments were determined to be highly unlikely and/or within acceptable ranges.

The greatest potential risk from site-related contaminants is by the future ingestion of contaminated groundwater. This exposure route is currently incomplete as there are no drinking water wells currently drawing water from the contamination plume. However, under CERCLA, USEPA must consider both current and potential exposure scenarios in determining the risks from exposure to the site. Although current land use in the plume area north of the site is golf course and forest, the area is zoned high density residential and thus is a potential area for residential development. In addition, a goal of the Superfund program is to restore groundwater to its most beneficial use whenever possible. Given the statutory and policy goals of the Superfund program, USEPA considered the risks from potential future use of the groundwater.

USEPA has therefore concluded that actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in the Record of Decision, may present an imminent and substantial endangerment to the public health, welfare, or the environment.

2.5 REMEDY SELECTION PROCESS

The FS defined the basic remedial objectives for the site to be contaminant source control and migration control. Technologies which could be useful in attaining these objectives were then identified and subjected to an initial screening to select the most promising approaches. These remaining technologies were then assembled into a group of remedial action alternatives which were subjected to a detailed analysis. The five alternatives were evaluated by a comparative analysis technique according to the nine evaluation criteria contained in the NCP. These included overall protection of human health and the environment; compliance with Applicable or Relevant and Appropriate Requirements (ARARs); reduction of toxicity, mobility, or volume; implementability; short-term effectiveness; long-term effectiveness; cost; community acceptance; and state acceptance.

Based upon all relevant considerations, USEPA selected FS Alternative 3, Source Control by In Situ Vapor Stripping with Groundwater Extraction and Treatment, as the remedy for the Site.

3.0 DESCRIPTION OF THE SELECTED REMEDY

3.1 GOALS

The primary goals of the selected remedy are to eliminate or reduce the risks posed by potential ingestion of contaminated groundwater and direct contact with the contaminated soils associated with the Site. Additional goals are to meet statutory preferences for remedies as specified in CERCLA. Performance standards are specified in Appendix D of the Consent Decree.

3.2 SUMMARY OF REMEDY

The remedy is comprised of three components:

1. A groundwater extraction and treatment component to quickly halt plume migration, with the long-term effect of returning the groundwater to its most beneficial use;

2. The innovative technology of *in situ* vapor stripping that uses vacuum wells to volatilize and remove volatile organic compounds from the landfill materials and surrounding soils; and

3. The additional protection provided by institutional controls to restrict the use of contaminated groundwater and the installation of security fencing around the property to prevent direct human contact with contaminants at the Site.

These measures will be taken to supplement the existing remedial actions implemented in 1984 which include the composite cap and revegetation which significantly reduce percolation of incident precipitation thereby reducing that aspect of leachate production, and the upgradient groundwater cut-off wall which further reduces leachate produced by groundwater flow through the landfill waste.

3.3 DETAILED DESCRIPTION

3.3.1 Groundwater Extraction and Treatment

Lord will implement the remedy set forth in the ROD. The remedy is to include the extraction and treatment of groundwater from the areas directly adjacent to the perimeter of the landfill and to the north of the landfill. The extraction and treatment will be implemented to halt the addition of new contamination to the groundwater plume and to remove the contaminants currently contained in the migrating plume. Based on the FS Report approved by DER, and as further specified in the "Refined Groundwater Model Report" submitted to EPA and DER by Lord Corporation in October 1989, the groundwater recovery system is currently expected to consist of: 1) a series of well points in the Water Table Aquifer immediately downgradient of the landfill; 2) six extraction wells in the Intermediate Zone immediately downgradient of the landfill; and 3) five extraction wells in the Intermediate Zone in the plume. The extracted groundwater will be pumped to an on site groundwater treatment system. At a minimum, this system shall provide pretreatment for the removal of iron and other metals, which is necessary for the effective operation of the treatment system and for achieving discharge standards, and air stripping for the removal of volatile organic compounds. In the detailed design of the groundwater treatment system other components may be added, as necessary, to achieve the discharge standards. The treated groundwater shall be discharged to the unnamed tributary of Elk Creek, subject to National Pollutant Discharge Elimination System (NPDES) permit regulations.

With the exception of air and water vapor, the emission of the stack gas will consist of volatile organic compounds. These emissions will meet permit regulations for atmospheric emissions in accordance with the Pennsylvania Air Pollution Control Act, 25 PA Code Section 127.1, requiring that emissions be the minimum attainable through the use of best available technology. Based on the FS Report, it is currently expected that the emissions will be of "minor significance" as defined at 25 PA Code 127.14(8).

Cleanup goals for the groundwater presented in Table 3-1, which are set forth in the ROD and incorporated by reference herein, were developed using existing or proposed Maximum Contaminant Levels (MCLs). Where no MCL was available or

TABLE 3-1

GROUNDWATER CLEANUP LEVELS
FOR THE LORD-SHOPE LANDFILL SITE

Parameter	Concentration (μg/l)	Cleanup Level Basis
Acetone	3,500	Risk Based Calculation[a]
Arsenic	2	Risk Based Calculation[b]
Barium	1,000	MCL
Benzene	5	MCL
1,2-trans-Dichloroethene	100	Proposed MCL[c]
Lead	15	Risk Based Calculation[d]
Methyl Ethyl Ketone	1,750	Risk Based Calculation[a]
Methyl Isobutyl Ketone	1,750	Risk Based Calculation[a]
Tetrachloroethene	5	Proposed MCL[c]
Trichloroethene	5	MCL
Vinyl Chloride	2	MCL[e]

[a]The risk based calculations performed for the indicated noncarcinogenic compounds are calculated by comparing chronic human intake to Reference Dose information obtained either from the EPA's Integrated Risk Information Service (IRIS) database (June 1989) or from the April 1989 Health Effects Assessment Summary Tables (HEAST). The ratio of these values is not to exceed 1.0.

[b]The risk based calculation performed for arsenic is predicated on an excess cancer risk of 10^{-4}.

[c]Proposed in Federal Register, May 22, 1989.

[d]The risk based level for lead is based on studies that indicate drinking water levels of 15 ppb and lower correlate to blood levels below the concern level of 10 μg/dl.

[e]Risk based calculations performed on the MCL for vinyl chloride show an excess cancer risk of 1.4×10^{-4}. This limit is based on the limit of detection for this compound and is considered to be protective.

where the other factors set forth in Section 300.430(e)(2)(i) of the NCP so require, health-based risk levels were used in setting the cleanup goals for the groundwater at this Site. As a result of this analysis, the cleanup goals were set to levels representing 10^{-4} excess cancer risks or hazard indices not exceeding 1.0 for each contaminant determined to be present in groundwater in concentrations above the appropriate MCL or health-based risk level. The groundwater cleanup level goal for arsenic is below the background concentration of arsenic at the Site as reported in the RI Report. Further, as part of the remedy, background concentrations of each contaminant will be determined through groundwater monitoring. To the extent that the concentration of any contaminant exceeds the background concentration, the cleanup level will be modified to or set at the background concentration unless attainment of background is determined to be infeasible or is otherwise waived under Section 121(d)(4) of CERCLA, 42 U.S.C. Section 9621(d)(4).

3.3.2 In Situ Vapor Stripping

In accordance with the CERCLA preference for remedies that address the source of contamination and that utilize treatment to reduce the toxicity, mobility, or volume of hazardous substances, the in situ vapor stripping component of this alternative will remove and treat volatile and semi-volatile organics from the vadose zones of the landfill and surrounding contaminated soils in the landfill toe area and crested soil area. Additionally, in situ vapor stripping is expected to reduce the duration of the groundwater extraction and treatment needed to attain the cleanup levels.

In situ vapor stripping is a process in which air is introduced through vent pipes, passes through the media, and is withdrawn through vapor extraction wells. As the air passes through the media, the volatile organics absorbed onto the soil or other materials are partitioned into the air stream ("off gas") and removed as the air is extracted. This air stream is then collected and treated for contaminant removal by carbon adsorption or another appropriate process to be determined in the detailed design.

The emissions from the in situ vapor stripping process will be treated to conform to the substantive requirements of the Pennsylvania Air Pollution Control Act as set forth in 25 PA Code Section 127.1.

The cleanup criteria for soils in the landfill toe area and the crested soil area will be determined during design by considering the characteristics of the soils and associated contaminants and then deriving specific levels of contaminants in the soils that would not be expected to exert a significant impact on the underlying groundwater. If that evaluation indicates that the source has not been sufficiently reduced, then further remedial action will be implemented at the Site.

Due to the heterogeneous nature of the landfill materials it is impossible to generate a single set of characteristic values that would be representative over the areal extent of the landfill. Further, efforts to collect samples of the landfill material for the generation of values to characterize subsections of the landfill could not be substantiated as being representative over a significant area. Therefore, the traditional methods for determining the completeness of the treatment and the effective end point are not applicable.

Meaningful target goals for final contaminant concentrations in the landfill materials would be both difficult to establish and subsequently verify. Additionally, the sample cores necessary for intermediate and final analyses represent numerous additional events where the integrity of the existing landfill cap would be breached. Consequently, the end point for the in situ vapor stripping phase of this alternative will be determined based on performance criteria for this technology.

Indicator compounds for evaluation will be chosen according to their presence and prevalence in the initial off gas, toxicity, and physical characteristics which would affect stripping rates. It is estimated that five volatile organic indicators will be selected, along with carbon dioxide as an indicator of the breakdown of any heavier, nonvolatile organics due to biodegradation enhanced by increased air flow.

The system will operate until nondetect levels or no significant removal levels of the determined indicator compounds have been demonstrated for three consecutive months and subsequent spike values reveal nondetect or no significant removal levels.

"Spike" values refer to the initial concentrations displayed in off gas when the system is either started up initially or when the system is "pulsed" (restarted after being shut off for a period to allow the system to re-equilibrate).

The "no significant removal" levels will be determined based on evaluation of concentrations of constituents in the off gas and statistical analysis of mass of constituents extracted per unit time, rate of decline of mass extraction, and spike concentrations.

At the completion of the in situ vapor stripping phase, the effectiveness of the treatment will be evaluated with respect to the levels of contaminants remaining in the landfill materials and surrounding soils and the continued impact of these media to the groundwater.

To be considered in the implementation of an in situ vapor stripping system at the Lord-Shope Landfill are the existing cap and high natural water table. These physical characteristics will effectively act as boundaries to airflow and can be used, with strategic placement of air vents and extraction wells, to increase the overall efficiency of the system.

3.3.3 Institutional and Access Controls

A further component of this remedy is the implementation of institutional controls to restrict the permitting and construction of groundwater wells in the area of the contaminated groundwater plume. This would prevent ingestion by humans and interference with the efficiency of the groundwater extraction system. These institutional controls would remain in effect until all groundwater cleanup levels are achieved in the current plume area and back to the perimeter of the landfill ("area of attainment").

This alternative also includes the installation of a security fence around the property to prevent human contact with the seeps and contaminated soils and to protect the treatment system and equipment.

3.4 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

The ROD identifies specific ARARs which the remedy is to comply with. These are listed below.

1. Chemical-Specific ARARs

a. Relevant and appropriate Maximum Contaminant Levels (MCLs) promulgated under the Safe Drinking Water Act, 42 USC § 300f to 300j-26, and set forth at 40 CFR §§ 141.11(b) and 141.61(a) and proposed MCLs set forth in 54 Fed. Reg. 22062 (May 22, 1989) are:

Substance	MCL/(Proposed MCL)
Benzene	5 ppb
Chlorobenzene	(100 ppb)
Tetrachloroethene	(5 ppb)
Toluene	(2,000 ppb)
Trans-1,2 dichloroethylene	(100 ppb)
Trichloroethene	5 ppb
Vinyl Chloride	2 ppb
Arsenic	50 ppb
Barium	1,000 ppb
Cadmium	10 ppb
Chromium	50 ppb
Lead	50 ppb

b. The Pennsylvania ARAR for groundwater for hazardous substances is that all groundwater must be remediated to "background" quality as specified by 25 PA Code Section 75.264(n). The Commonwealth of Pennsylvania also maintains that the requirement to remediate to background is also found in other legal authorities. As described in the ROD, groundwater monitoring to determine the background concentrations of the contaminants will be part of the remedial alternative. Such background levels shall be attained as part of the remedial alternative, unless it is demonstrated that attaining such levels is infeasible or otherwise waivable under CERCLA Section 121(d), 42 USC Section 9621(d).

c. The National Emissions Standards for Hazardous Air Pollutants (NESHAPs) set forth at 40 CFR § 61.63 and promulgated under the

Clean Air Act, 42 USC § 7401, contain an emission standard for vinyl chloride plants which is relevant and appropriate to the air stripping and in situ vapor stripping treatment. The vinyl chloride emission standard is 10 ppm (average for three-hour period).

2. Location-Specific ARARs

USEPA's Statement of Procedures on Floodplain Management and Wetlands Protection, 40 CFR Part 6, Appendix A, requires a determination of the extent of wetlands located on the Site or affected by the remedy, and requires that the design of the remedy minimize potential impacts to wetlands at the Site. This ARAR was identified after issuance of the ROD and therefore was not set forth in the ROD.

3. Action-Specific ARARs

a. 25 PA Code Sections 123.1 and 123.2 are applicable to the remedial alternative, and require that dusts generated by earthmoving activities be controlled with water or other appropriate dust suppressants.

b. To the extent that new point source air emissions result from the implementation of the remedial alternative, 25 PA Code Section 127.12(a)(5) will apply, requiring that emissions be reduced to the minimum obtainable levels through the use of best available technology (BAT), as defined in 25 PA Code Section 121.1.

c. Treatment and discharge of contaminated groundwater to an unnamed tributary of Elk Creek will cause the requirements of Pennsylvania's NPDES program to apply. Those requirements, as set forth in 25 PA Code Sections 93.1 through 93.8, include permitting, design, discharge, and monitoring requirements which will be met in implementing the remedial alternative.

d. 25 PA Code Sections 102.11 through 102.24 contain relevant and appropriate standards requiring the development, implementation, and maintenance of erosion and sedimentation control measures and

facilities which effectively minimize accelerated erosion and sedimentation.

e. 25 PA Code Sections 105.291 through 105.314, promulgated in part under the Pennsylvania Dam Safety and Encroachments Act of 1978, set forth applicable permitting and design requirements relating to the groundwater treatment discharge pipe/headwall construction.

f. 25 PA Code Sections 264(o)(2), (10)-(14) and 264(v)(3)(xxvi)(F)(I), (IV) and (V) contain relevant and appropriate requirements precluding any breaches of the integrity of the existing landfill cap except under certain circumstances, which will be met by the remedial alternative. Those provisions also will require adequate repair of the landfill cap.

g. The groundwater treatment and in situ vapor stripping treatment will be implemented consistently with the requirements of 40 CFR Section 262 (regarding standards applicable to generators) and the substantive requirements for the treatment, storage, and disposal of hazardous wastes set forth in 40 CFR Sections 263 (regarding transporters of hazardous wastes) and 264 Subparts B-H (regarding general requirements for TSD facilities).

4.0 REMEDIAL DESIGN SCOPE OF WORK

The scope of the Remedial Design for the Lord-Shope Landfill Superfund Site will consist of pre-design activities and the Remedial Design of three major technology components: groundwater extraction, groundwater treatment, and in situ vapor stripping. Work tasks included in the Scope of Work are described below.

4.1 PRE-DESIGN SCOPE

4.1.1 Remedial Design Work Plan (This Document)

Lord Corporation has prepared and submitted to USEPA for review this Remedial Design Work Plan which describes in detail the scope and schedule of the project. This Remedial Design Work Plan has been prepared in a manner which is consistent with the SOW, ROD, Consent Decree, NCP, CERCLA, and OSWER Directive 9355.0-4A. This Remedial Design Work Plan presents the schedule for expeditious completion of the Remedial Design, in Section 4.3.

4.1.2 In Situ Vapor Stripping (ISVS) Treatability Study Work Plan (Complete)

Lord will conduct a pilot-scale ISVS treatability study at the Site to generate final design criteria and cleanup performance criteria for the landfill and contaminant level cleanup goals for the soil. A work plan for the treatability study has been prepared and previously submitted to USEPA for approval, setting forth the protocols and methodologies for the study as well as an expeditious schedule for completion of the study. The work plan is consistent with the guidance provided in "Guide for Conducting Treatability Studies Under CERCLA" (EPA/540/2-89/058, December 1989).

4.1.3 Groundwater Treatability Study Work Plan (Complete)

Lord will also conduct a pilot-scale groundwater treatability study at the Site to determine final design criteria for the groundwater treatment system. A work plan for this study has been prepared and submitted to USEPA for approval, setting forth

test protocols and methodologies and an expeditious schedule for completion of the study. The Work Plan is consistent with EPA/540/2-89/058.

4.1.4 Treatability Study Construction Quality Assurance Project Plan

A construction quality assurance plan for the treatability study is included herein as Appendix A.

4.1.5 Health and Safety Plan for Remedial Design Activities (Complete)

A revised Site Health and Safety Plan (HSP) has been prepared for all field activities which will be conducted during the Remedial Design process. The HSP considers available Site information as well as the hazards presented by the activities to be conducted.

4.1.6 Quality Assurance Project Plan (QAPP) (Complete)

A Remedial Design Quality Assurance Project Plan has been prepared and submitted by Lord to USEPA for approval. This plan incorporates the previously-approved QAPP for the RI with modifications to reflect pre-design work tasks (e.g., treatability study chemical analyses).

4.1.7 Treatability Studies

Lord will conduct the pilot-scale ISVS and groundwater treatability studies at the Site in accordance with their respective approved work plans. A report will be prepared by Lord at the conclusion of each of the two studies and submitted to USEPA for approval which summarizes the results of the test work and provides process design criteria. The ISVS Treatability Report will also present the methodology and protocols to be used for determining the overall effectiveness of the ISVS at the conclusion of the ISVS component of the Remedial Action. The treatability study reports will be submitted to USEPA by Lord as part of the preliminary design submittal as set forth in Section VI.B.4 of the Consent Decree (see Section 4.2.1).

4.1.8 RD Permitting Requirements Plan

Certain permits/approvals are required for the RD field activities. These are described in Appendix B of this document.

4.1.9 *Hydrogeologic Support*

It is expected that no other additional characterization or evaluation of the existing water-bearing zone conditions of the Site will be conducted as a part of the Remedial Design. The existing hydrogeologic data as presented in the Remedial Investigation Report and Refined Groundwater Model Report are adequate in order to proceed with the design of the groundwater recovery system. As specified in the SOW, certain hydrogeologic support tasks are necessary for completion of the Remedial Design. These are described below.

4.1.9.1 Background Groundwater Quality. Background groundwater quality values for the Water Table and Intermediate water-bearing Zones were determined as a part of the Remedial Investigation, as presented on Tables 5-10 and 5-11 of the RI report. These values were based upon data collected through August 1988. However, additional water quality data are now available from the semi-annual monitoring that continues to be conducted at the site. Therefore, background groundwater quality values for the two zones have been recharacterized based on data collected through late 1990, as required by the SOW.

The selection of the wells from which the contemporaneous background groundwater quality data have been based is slightly different than that utilized in the RI. Only two complete sets of water quality analyses were available from the upgradient monitoring well cluster, W-26(A,B,C), for the determination of background via the associated statistical analysis at the time that the RI was conducted. Two sample data sets from only one well in each zone were judged to be insufficient for statistical purposes, such that three well clusters located far downgradient of the site were also used for the determination of background in the RI. These downgradient wells, termed the "Early Warning" wells, included W-29(A,B), W-30(A,B), and W-31(A,B).

At this time, however, more data are available from the upgradient monitoring well cluster such that it is unnecessary to utilize the Early Warning wells for the determination of background. Therefore, well W-26A was used for the characterization of background in the Water Table Zone and well W-26B was used for characterization of background in the Intermediate Zone.

No organic constituents have been detected in the background wells, with only a few minor exceptions. Therefore, background quality for all of the organic cleanup goals is considered to be Practical Quantitation Limits (PQLs).

Background levels of a number of metals have been detected. However, the Below Method Detection Limit (BMDL) results make it somewhat difficult to numerically characterize the concentrations of these parameters over time. Consistent with the methodology utilized in the RI, the background data have been characterized by calculating the geometric mean of each parameter with the BMDL values set to one-half the detection limit. The resultant background concentrations for each of the two water-bearing zones are presented in Table 4-1.

4.1.9.2 Observation of Monitoring Well W-33. The yield from groundwater monitoring well W-33 installed during the Supplemental RI has decreased substantially from when it was first installed. In fact, the yield has decreased to less than one gallon per minute, rendering it ineffective for the groundwater monitoring it was installed to provide. Subsequently, monitoring well W-33 was replaced by well W-34 during the RI to provide the data necessary to characterize the quality of the plume in this location.

At this time, insufficient data are available to accurately assess the problem of the decreasing well yield. Problems of this kind can be attributed to an encrustation of the well screen, corrosion of the well screen to the point of collapse, silt clogging the sand pack and ultimately the well screen, and possibly a clogging of the well screen by a viscous iron bacteria, among others.

ECKENFELDER, INC. proposes the removal and subsequent inspection of the well screen to assess the problem. Evidence of: scaling of the metal well components,

TABLE 4-1

GEOMETRIC MEANS OF BACKGROUND GROUNDWATER QUALITY DATA
LORD/SHOPE SITE
GIRARD TWP., PENNSYLVANIA
(ppb)

Constituent[a]	Water Table[b] Well 26-A	Intermediate[c] Well 26-B
Aluminum	<200[e]	472
Antimony	<25	<25
Arsenic[d]	<5	<5
Barium[d]	83.2	58.8
Beryllium	<5	<5
Cadmium	<5	<5
Calcium	12,302	26,211
Chromium	<10	6.05
Cobalt	<50	<50
Copper	12.0	16.1
Iron	4,958	9,365
Lead[d]	<5	6.98
Magnesium	3,195	5,908
Manganese	35.3	162
Mercury	<0.0002	<0.0002
Nickel	<40	<40
Potassium	3,952	8,430
Selenium	<5	<5
Silver	5.74	<10
Sodium	2,913	26,137
Thallium	<5	<5
Vanadium	<50	<50
Zinc	14.6	33.4

[a]Background groundwater quality values for Site-derived organics are their respective PQLs.

[b]Data collected from upgradient well W-26A, 1988 through 1990.

[c]Data collected from upgradient well W-26B, 1988 through 1990.

[d]USEPA has specified cleanup levels for these three metals and eight organic compounds (see Table 3-1).

[e]<... Indicates all measurements are less than the detection limit. Value given is detection limit.

encrustation of the well screen, and the presence of iron bacteria will be assessed. This will be completed to assure that reasonable countermeasures will be incorporated into the design and/or operation of the extraction wells that prevent the conditions affecting well W-33 from affecting the extraction wells to be installed as part of the remedial action. A technical memorandum will be prepared to summarize the results of the field observations.

4.1.9.3 Review of Recent Water Quality Data. Several groundwater monitoring events have occurred since the completion of the RI. These data will be reviewed and then compared with the previous database to see if there have been any significant changes which need to be considered in the Remedial Design. A brief technical memorandum will be prepared to summarize the results of this review.

4.1.9.4 Provision of Groundwater for Treatability Study. Groundwater extraction wells will be installed in three locations to provide representative groundwater to be used in the pilot-scale treatability study: (1) in the Water Table Zone immediately downgradient of the landfill; (2) in the Intermediate Zone immediately downgradient of the landfill; and (3) in the Intermediate Zone further away from the landfill in the center of the plume. Each of these extraction wells is also intended to be used as part of the remedy. As described in detail in Appendix C, two (2) wellpoints will be installed in the Water Table Zone and one (1) extraction well will be installed at each of the two (2) locations stated above. Temporary piping will convey the groundwater to the treatability equipment.

4.1.10 Discharge Conveyance for Groundwater Treatability Study

A temporary conveyance system for the treated groundwater from the pilot-scale treatability study will be installed by Lord. This system will route the treated groundwater to the unnamed tributary of Elk Creek to the west of the Site. The temporary piping will be removed at the conclusion of the groundwater treatability study.

4.1.11 Supplemental Land Surveying

Although topographic maps are available for the Site and surrounding areas, limited supplemental surveying work will be necessary to confirm specific elevations,

establish baselines, boundaries, etc. Results of such supplemental land surveying will be submitted by Lord to USEPA with the prefinal design submittal (see Section 4.2.2).

4.2 DESIGN SCOPE

The Remedial Design phase of the work will involve preparation and submittal of technical plans and specifications at various stages of completion (preliminary, prefinal, and final) as specified by the Consent Decree and Statement of Work and as generally described in the USEPA "Superfund Remedial Design and Remedial Action Guidance Manual" (June 1986). Additionally, this project will involve the development and submittal of the following support plans for use during remedial operations.

- Health and Safety Plan Specification
- Operation and Maintenance Plan
- Remedial Action Permitting Plan
- Decontamination Plan
- Construction Quality Assurance Plan
- Field Sampling Plan
- Groundwater Monitoring Plan
- Wetlands Impact Reduction Plan (if necessary)
- Remedial Action Contingency Plan

This section of the Work Plan describes generally how the remedial design work products are to be prepared and submitted to the USEPA for review.

4.2.1 Preliminary Design

This deliverable is essentially the submission of the remedial design at approximately the 30 percent stage of completion. Work products which will have been initiated and addressed in the submittal are as follows:

- Results of treatability studies and additional field sampling
- Design criteria
- Wetlands delineation work plan and schedule

- Project delivery strategy
- Preliminary plans, drawings, and pencil sketches
- Outline specifications
- Preliminary construction schedule
- Preliminary permit acquisition plan

Results of treatability studies and additional field sampling will consist of submission of the final groundwater treatability study report and the final ISVS report. These reports will include recommendations and conceptual process flow diagrams. The additional field sampling anticipated will consist of any groundwater monitoring results consistent with the on going groundwater monitoring program and any geotechnical/foundation investigation report results.

Design criteria will consist of an outline indicating pertinent criteria related to the various disciplines of engineering. Some of the design criteria will be established based on the outcome of the treatability studies. After completion of preliminary design, it is expected that groundwater treatment process and ISVS detail design can begin. Anticipated components of the design criteria include:

- Architectural/Structural
  - Design Loads
  - Foundation Requirements
  - Materials and Performance
  - Space Requirements (for equipment, etc.)
  - Use Group Classification
- Mechanical
  - HVAC Requirements
  - Materials and Performance
  - Plumbing (Water)
  - Fire Protection
  - Ancillary Systems

- Electrical

  - Power Requirements
  - Materials and Performance
  - Lighting Requirements
  - Ancillary Systems

- Environmental

  - ISVS Treatment Process
  - Groundwater Treatment Process
  - Ancillary Systems (Pumping Systems, etc.)

A wetlands delineation work plan and schedule have been prepared in advance and are included herein as Appendix D. The objective of the delineation will be to identify and map the extent of wetlands within the range of influence of the groundwater extraction program as well as any other activities at the site.

A project delivery strategy will be submitted which will consist of a description of the contents of the Remedial Design Report (a compilation of all information to be included in the prefinal submission). The strategy will also include a preliminary list of anticipated drawings, and the anticipated means of implementing the remedial action (i.e., the number of prime contractors and their responsibilities, any work to be done by the Owner, any equipment to be purchased by the Owner, etc.).

Preliminary plans, drawings, and sketches will primarily represent the groundwater extraction system, the ISVS extraction system, and various site work plans and details. As discussed above, process flow diagrams for the groundwater treatment and the ISVS system will also be included, however, detailed design of the components and the ancillary components (the treatment building and other equipment) will be included in the prefinal submission.

Outline contractual and material, equipment, and procedure specifications will address various aspects of the work and supplement the drawings. The contract specifications will include general requirements and other related items. As part of

the outline general requirements an outline construction Health and Safety Plan Specification will also be included.

Outline technical specifications will cover the following general topics, which will be further refined during actual development of the specifications:

- Site Preparation
- Earthwork
- Sediment and Erosion Control
- Fencing
- Groundwater Extraction Wells and Wellpoints
- ISVS Extraction System
- Piping
- Concrete
- Groundwater Treatment Equipment
- ISVS Equipment
- Pre-engineered Buildings
- Ancillary Building Equipment (HVAC, fire protection, compressed air, etc.)
- Mechanical
- Electrical Power and Lighting
- Electrical Controls

The technical specifications will be prepared in a format similar to that of the Construction Specification Institute (CSI) and will define:

- Description of work
- Related work
- Quality assurance/control
- Submittals
- Materials
- Construction or execution
- Defective work
- Payment

The preliminary construction schedule to be submitted will include identified milestone activities presented in a bar chart format. This schedule will be subject to change and further delineation during the remainder of the remedial design.

The preliminary permit acquisition plan to be submitted will identify and briefly describe the permits that are known to be needed for the implementation of the remedial action, along with anticipated acquisition time frames. All permits associated with the daily construction activities are assumed to be the responsibility of the remedial action contractor(s) and will not be included.

4.2.2 Prefinal Design

The prefinal design phase begins following receipt of USEPA review comments on the Preliminary Design submittal. The Prefinal Design represents the 90 percent completion stage of the remedial design. This submittal will consist of the following design components.

- Design plans and specifications
- Operation and Maintenance Plan for the remedial action
- Remedial Action Construction Quality Assurance Plan (CQAP)
- Field Sampling Plan
- Groundwater Monitoring Plan
- Final Contractor Health and Safety Plan Specification
- Decontamination Plan
- Final Remedial Action Permitting Requirements Plan
- Remedial Action Contingency Plan
- Wetlands Impact Reduction Plan (if necessary)
- Engineering Design Analysis and Calculations

Prefinal design plans and specifications will be developed and submitted. These plans will include treatment building plans, site plans, site preparation and soil erosion control plans, groundwater extraction and ISVS plans and details, groundwater treatment and ISVS system piping, equipment, and instrumentation plans, groundwater intake and discharge piping plans and profiles, and all associated architectural, structural, mechanical, and electrical plans, sections, and details. Specifications will include general bidding requirements, general

requirements, exhibits pertaining to bonding, performance, payment schedules, sequence of construction, type of construction, services and materials to be supplied, method of controlling subcontractors, quality control procedures, instructions to bidders, bid forms and other necessary forms, supplemental conditions, special requirements and other contractual requirements, in addition to the technical specifications. The outline specifications provided in the preliminary design submittal will be expanded into complete specifications for all materials, equipment, and procedures. The presentation of the plans and specifications will be consistent with the outlined project delivery schedule. Results of the treatability studies will dictate process design, while specific equipment and process conveyance media and other details will be finalized in the plans and specifications.

An Operation and Maintenance Plan (to be used after the remedial action is complete) will be developed and submitted. This plan will describe in detail all anticipated operation and maintenance requirements for the ISVS system and the groundwater extraction and treatment systems. Key components of the plan will include development of O&M manuals, O&M tasks and their frequencies, monitoring tasks (both on site and remote), recordkeeping tasks, reporting tasks, and a Health and Safety Plan for operation.

A remedial action Construction Quality Assurance Plan (CQAP) will be submitted. The CQAP activities will include:

- Review of contractor qualifications
- Review of contractor plans
- Monitoring compliance of the contractor with plans, specifications, and contract terms, including observations and tests to be used in monitoring construction
- Monitoring and reporting the progress of the work
- Review and approval of contractor(s) claims for payment
- Review and evaluation of change order requests

- Compilation of project documentation

The CQAP will also include a description of activities, project organization, authority and responsibilities of project staff, special procedures, and schedule of activities.

A Field Sampling Plan will be developed and submitted. This plan will be directed at monitoring construction performance and will include air sampling, other health and safety related monitoring requirements, and equipment and material performance monitoring (i.e., pipe pressure tests, tests on pumping equipment, etc.).

A Groundwater Monitoring Plan will be developed which will include monitoring residential wells, early warning wells, and other groundwater monitoring wells. This monitoring will measure progress towards meeting performance standards. The monitoring plan will specify sampling methods, monitoring frequencies, analytical parameters, and report requirements.

As part of the remedial design plans and specifications, a complete remedial action Health and Safety Plan Specification will be included. This specification will outline in detail the minimum requirements of the contractor health and safety plan (to be developed and implemented by the selected contractor(s)) throughout remedial action activities at the site.

The Decontamination Plan, which will also be incorporated into the remedial design plans and specifications, will provide complete specifications for preparation of procedures and plans for the decontamination of equipment and disposal of contaminated materials. Minimum performance requirements for decontamination equipment and components will be included in the specification.

A Remedial Action Permitting Plan will be included in the prefinal submission. This plan, discussed in the preliminary design submittal requirements, will be finalized for this prefinal submission.

A Remedial Action Contingency Plan, to be implemented during remedial action activities at the site, will be developed. This plan will address the following topics:

- Pre-emergency planning
- Personnel roles, lines of authority, and emergency services
- Emergency recognition and prevention
- Evacuation routes and procedures
- Incident reporting
- Emergency medical treatment procedures
- Fire, explosion, spills, and leaks
- Emergency equipment and facilities

A Wetlands Impact Reduction Plan (WIRP) will be developed (if necessary) utilizing the results of the wetlands delineation. It will also specify the measures to be taken to avoid construction in wetlands on the site including the construction of remedial facilities in non-wetland areas. The WIRP will document the use of feasible upland alternatives and describe those situations in which no upland alternative is feasible. The WIRP will also specify the measures to be taken to avoid indirect construction-related impacts to the wetlands at the Site, including the effective isolation of wetlands otherwise not impacted by the construction. The WIRP will incorporate erosion and sedimentation controls, minimize required widths for roads and pipelines, limit the size of construction equipment, and establish buffer zones to the wetlands wherever possible.

A Design Analysis and Calculations document, separate from the plans and specifications (Contractor Bidding Documents), will be prepared for submission with the Prefinal Design. The purpose of the design analysis will be to state the logic behind design decisions and present design calculations with assumptions. Design requirements and provisions including a summary of existing conditions and contaminants as well as clean up criteria and other design criteria will be presented. Supplemental information, not incorporated into the design plans and specifications, will also be included. Supplemental information will include soil boring logs, survey information, and other basis of design information.

4.2.3 Final Design

After receipt of USEPA comments on the Prefinal Design, discussion, and revision, the Final (100 percent completion) Remedial Design will be submitted to the USEPA for final approval.

The remedial design tasks will be performed by both Lord Corporation and ECKENFELDER INC.. Key responsibilities of Lord will include design plans, specifications, analysis, and calculations related to the architectural, structural, HVAC, and electrical work associated with the project. ECKENFELDER INC. will be responsible for both of the treatability studies and plans, specifications, analysis, and calculations associated with the ISVS and the groundwater extraction and treatment systems including piping, equipment, and instrumentation. Lord will develop the contractual portion of the specifications with the assistance of ECKENFELDER INC.. Lord and ECKENFELDER INC. will coordinate as necessary and develop complete plans and specifications (Contractor Bidding Documents) and the design report.

4.3 REMEDIAL DESIGN SCHEDULE

The schedule to perform the remedial design described in this Work Plan is presented in Figure 4-1. This schedule is contingent on key tasks being completed on the dates outlined in the schedule, including USEPA reviews.

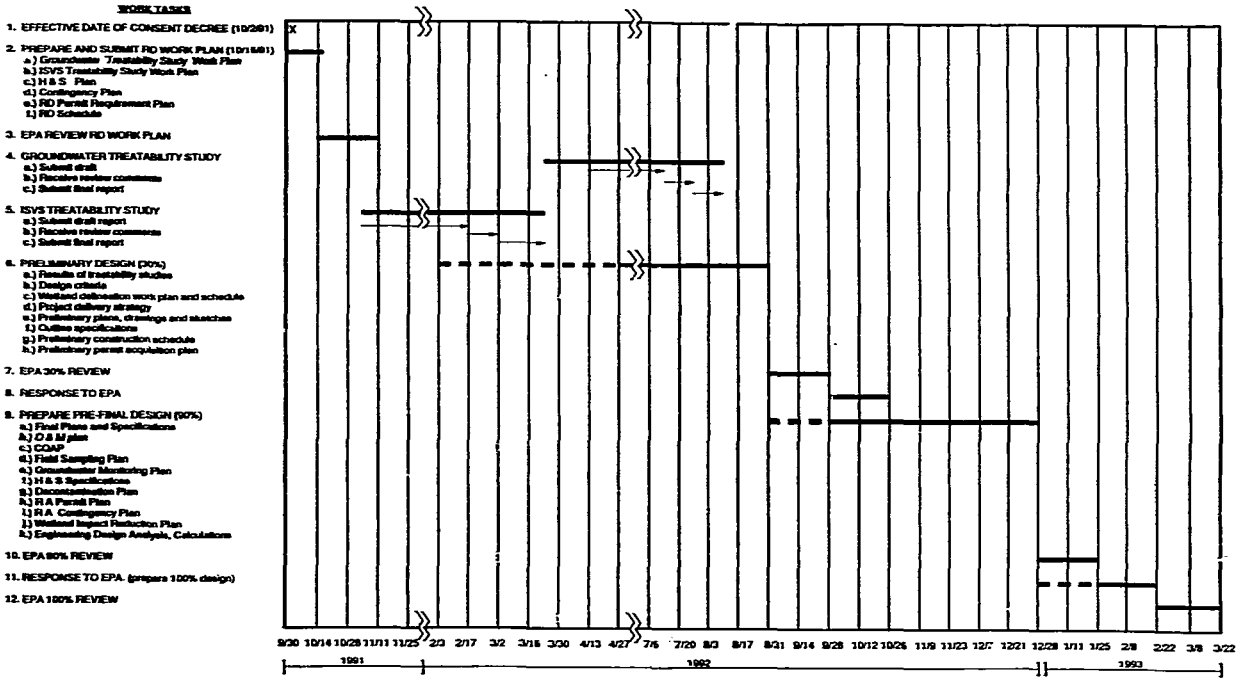


FIGURE 4-1

REMEDIAL DESIGN SCHEDULE - LORD SHOPE'S LANDFILL - GIRARD TOWNSHIP, PA.

APPENDIX A

TREATABILITY STUDY CONSTRUCTION QUALITY ASSURANCE PROJECT PLAN LORD-SHOPE LANDFILL SITE REMEDIAL DESIGN

APPENDIX A

TREATABILITY STUDY CONSTRUCTION QUALITY ASSURANCE PROJECT PLAN LORD-SHOPE LANDFILL SITE REMEDIAL DESIGN

1.0 INTRODUCTION

Two pilot-scale treatability studies will be conducted at the Lord-Shope Site during the remedial design project: a study to evaluate the treatability of the groundwater to be extracted from and near the site and an in situ vapor stripping (ISVS) study of the landfill and designated areas of adjacent soils. For the most part, these treatability studies involve temporary construction and prefabricated equipment which will be used for short periods of time. Therefore, the construction quality assurance requirements for the site at this point are only a fraction of what will be required for implementation of the remedial action once design is complete.

2.0 PURPOSE

This Construction Quality Assurance Plan has been developed to ensure that the treatability study equipment and installations meet or exceed all design criteria, plans, and specifications. By reference, it adopts the provisions of the two treatability study work plans and Appendix C of the Remedial Design Work Plan (which deals with installation of a limited number of groundwater extraction wells to supply raw water for the groundwater treatability study).

3.0 RESPONSIBILITIES, AUTHORITIES, AND QUALIFICATIONS OF KEY PERSONNEL

Overall quality assurance (QA) responsibilities for the treatability study and support efforts will be assumed by the respective task managers for each of the 3 areas of work. Certain of these responsibilities and authorities may be delegated to other project team members. Quality control (QC) will be the responsibility of each and every team member on assigned tasks. All of the team members have had ample education and training to accomplish their assigned tasks and responsibilities.

4.0 PROCEDURES

4.1 General

Each portion of the temporary field construction/installation will be inspected by the designated task leader as work proceeds. Identified deficiencies will be corrected as soon as practicable after discovery, but in no case will treatability operations be initiated unless deficiencies have been corrected. Deficiencies and corrective actions will be recorded in the field log books. All records will be retained in accordance with the requirements of the Consent Decree.

4.2 Groundwater Treatability Study

Minimal site preparation will be required for the groundwater treatability study. Equipment installation will not begin unless the study site is level. Electrical connections will be inspected by a qualified electrician and certified as proper and safe before they are energized. Prefabricated equipment is being purchased or leased for groundwater treatability tests. The equipment has been selected to be compatible with the service intended. All piping, fittings, and valves will be visually inspected for leaks at the beginning of pilot-plant startup.

4.3 In Situ Vapor Stripping Treatability Study

Minimal site preparation will be required for the in situ vapor stripping pilot trailer unit. Equipment installation will not begin unless the trailer site is level. Electrical connections will be inspected by a qualified electrician and certified as proper and safe before they are energized. Detailed Standard Operating Procedures (SOPs) are located in Appendix D of the ISVS treatability study work plan, covering pilot trailer status check, extraction well/monitoring probe installation, connections, and operations. These should be more than adequate to ensure the quality of construction.

4.4 Groundwater Extraction Wells

The groundwater extraction wells will be installed by qualified well drillers under the continuous supervision of an experienced hydrogeologist. Construction procedures and quality assurance are described in necessary and sufficient detail in Appendix C of the Remedial Design Work Plan.

APPENDIX B

RD PERMITTING REQUIREMENTS PLAN
LORD-SHOPE LANDFILL SITE REMEDIAL DESIGN

APPENDIX B

RD PERMITTING REQUIREMENTS PLAN
LORD-SHOPE LANDFILL SITE REMEDIAL DESIGN

A limited number of environmental permits/approvals are needed for the Remedial Design field work. There are identified below along with their present status.

1.	Notification of Regulated Waste Activity and Generator Identification Number	ID Number Issued
2.	Temporary Discharge Approval for Treated Groundwater	Approval and Limits Issued
3.	Exemption from Plan Approval and Permitting Requirements for Pilot-Scale Groundwater Air Stripper	Pending
4.	Exemption from Plan Approval and Permitting Requirements for Pilot-Scale In Situ Vapor Stripping Unit	Pending
5.	Exemption from Stream Encroachment Permit for Temporary Groundwater Discharge	Pending

APPENDIX C

INSTALLATION OF GROUNDWATER EXTRACTION WELLS LORD SHOPE REMEDIAL DESIGN

APPENDIX C

INSTALLATION OF GROUNDWATER EXTRACTION WELLS LORD SHOPE REMEDIAL DESIGN

1.0 INTRODUCTION

This scope of work outlines the methods and procedures to install groundwater extraction wells to be used in conjunction with the groundwater treatability study. Groundwater will be withdrawn from three different locations including the water table aquifer immediately downgradient of the landfill, the intermediate zone (Maumee IIIb) immediately downgradient of the landfill, and the intermediate zone (Maumee IIIb) further away from the landfill in the center of the plume. Each of the groundwater recovery wells used in conjunction with the treatability study is also intended to be used as part of the final groundwater recovery system.

In October 1989, ECKENFELDER INC. prepared a report titled "Refined Groundwater Model Report", in which a computer model was used to predict the optimum configuration of an extraction system to remediate the existing groundwater plume. The predictions included the locations and pumping rates of groundwater extraction wells to accomplish this goal. The well locations selected for this interim purpose are those which will yield the groundwater quality most representative of the plume as a whole. The groundwater collected at these locations is expected to be either representative of average or maximum concentrations of constituents in the plume.

2.0 SCOPE OF WORK

The scope of work described below includes the drilling and installation of the following:

- Two wellpoints ("WTP" wells) located at the base of the water table aquifer immediately downgradient of the landfill, capable of yielding approximately 1 gallon per minute each.

- One extraction well ("IPE" well) in the intermediate zone (Maumee IIIb formation) immediately downgradient of the landfill, capable of yielding approximately 2 gallons per minute.

- One extraction well ("IPL" well) in the intermediate zone (Maumee IIIb) in the plume, capable of yielding 10 to 20 gallons per minute.

The pumping equipment for each type of well is detailed in addition to the drilling and installation in this scope of work.

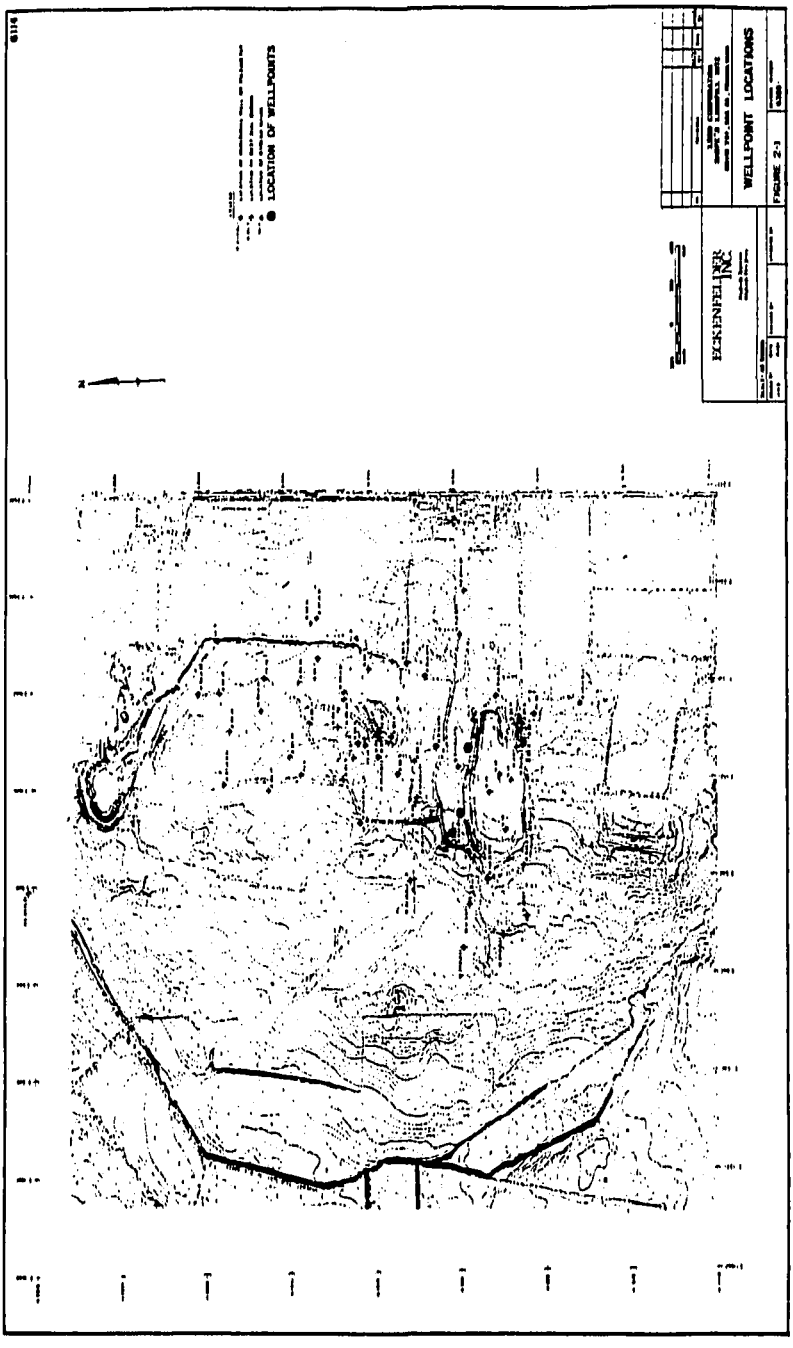
2.1 Wellpoint/Small Diameter Extraction Well Installation (WTP Wells)

Two-inch diameter wells will be installed immediately downgradient of the landfill in the water table aquifer. Each well will be installed to allow the screen to be placed in the bottom 5 feet of the aquifer.

2.1.1 Drilling Program. The wellpoints will be installed utilizing hollow-stem augers. The anticipated total depth of the well ranges from 20 to 30 feet depending on location. The wells will be installed to allow the bottom 5 feet of the aquifer to be screened. Split-spoon soil samples will be collected continuously to identify the bottom of the aquifer. The two small diameter extraction wells will be installed in the locations identified on Figure 2-1.

2.1.2 Well Installation. The wellpoints will be constructed with 2-inch diameter, black steel riser. The well screens will be 1 to 3 feet in length constructed with 2-inch diameter stainless steel and possess a 0.20-inch slot size. Typical well construction details are depicted on Figure 2-2.

The well screen, bottom plug, and casing will be assembled and lowered inside the hollow stem augers. Teflon® tape will be used at each joint in the well casing to ensure a tight seal. As the augers are slowly removed from the borehole, a graded sand will be placed in the annular space around the well screen and riser, from the base of the boring to approximately 3 feet above the top of the screen. The sand size will be Morie No. 2 or equivalent. A measuring tape will be periodically lowered down the annulus to confirm the sand pack has reached its desired depth and has not bridged above the screen in the annulus. A layer of bentonite pellets, 3 to 5 feet



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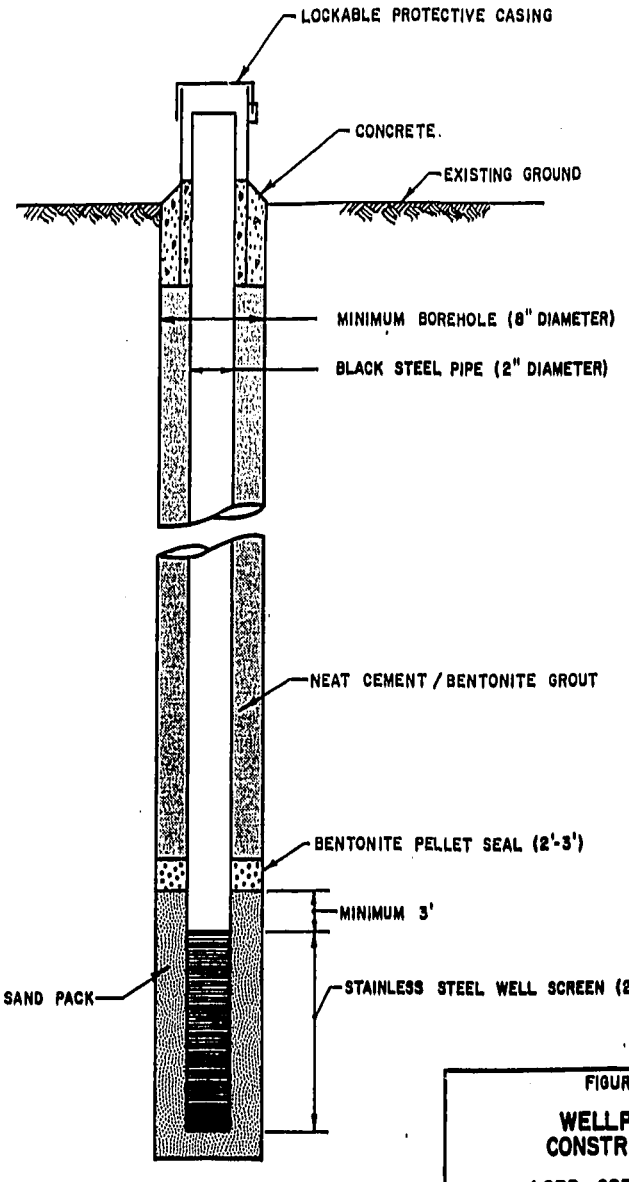


FIGURE 2-2

WELLPOINT CONSTRUCTION

LORD CORPORATION
SHOPE'S LANDFILL SITE
GIRARD TWP., ERIE CO., PENN.

ECKENFELDER INC. Nashville, Tennessee Mahwah, New Jersey

AR000373

thick, will be placed in the annular space on top of the sand pack. Again, a measuring tape will be periodically lowered down the annulus to ensure the bentonite pellets have reached their target depth. A neat cement grout consisting of 90 percent cement and 10 percent bentonite will be tremied down the annulus on top of the bentonite pellet seal until it reaches a level 4 feet below ground surface.

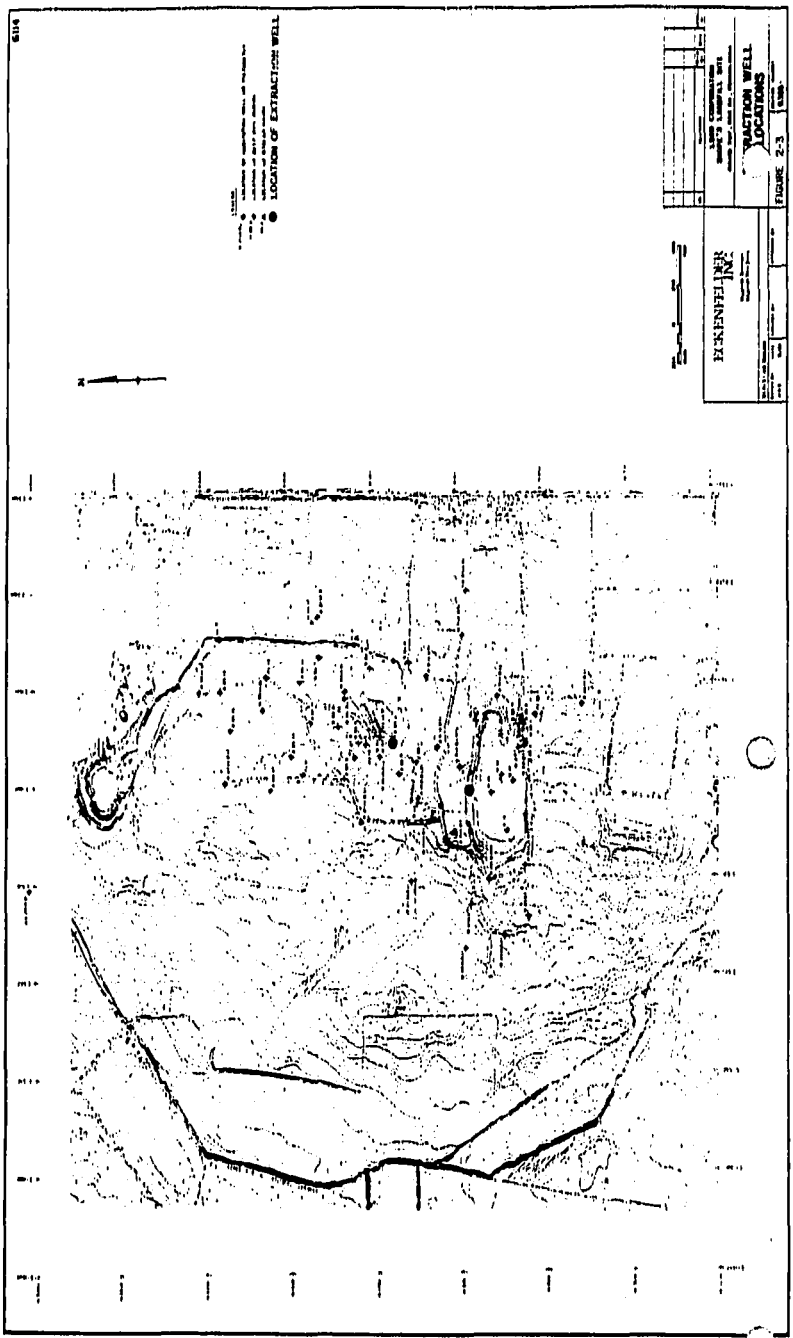
2.1.3 Well Development. The wellpoints will be developed with the use of a centrifugal pump and/or a bailer. Development will continue until the water becomes as sediment-free as practical.

2.1.4 Pump Installation. Water will be withdrawn from these wells with the use of centrifugal pumps or a suction manifold header. Neither method requires a pump to be placed inside the well. If a centrifugal pump is utilized, polyethylene suction tubing will be dedicated to the well. On/off switches for the pump will be located at the pump and in the groundwater treatability study pilot plant.

2.2 Intermediate Zone Extraction Wells (IPE And IPL Wells)

Six-inch diameter extraction wells will be installed in the intermediate Maumee IIIb formation beneath the site. The entire aquifer thickness will be screened and is anticipated to be approximately 10 feet thick. One of the extraction wells will be installed immediately downgradient of the landfill and the second well will be installed in the plume. The anticipated total depth of each well will range from 40 to 70 feet. The locations of the extraction wells are displayed on Figure 2-3.

2.2.1 Drilling Program. Each 6-inch diameter extraction well will be installed in a 12-inch diameter borehole cased with black steel casing drilled by either the ODEX or cable tool methods. The anticipated total depth of each borehole ranges from 40 to 70 feet. During the drilling operation, a hydrogeologist will record a lithologic log by monitoring the cuttings exiting the borehole. When the on site hydrogeologist determines (based on existing stratigraphic data) that the depth is approximately 10 feet from the top of the target aquifer, split-spoon soil samples will be collected continuously until the entire length of the intermediate zone (Maumee IIIb) has been penetrated. At least one split-spoon soil sample will be collected from the formation below the intermediate zone (Maumee IIIb) to confirm the location of the bottom of the aquifer.



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2.2.2 Well Installation. Each extraction well will be constructed according to American Water Works Association (AWWA) well construction standards. Each well screen will be constructed of 6-inch diameter, wire-wrapped stainless steel (304) (Johnson or equivalent). Each well screen will have a 6-inch diameter sump 3 feet in length, constructed of black steel, welded to the bottom to collect any fine-grained sand or silt which may enter the well screen. At this time it is anticipated that all of the well screens will be 10 feet in length.

Because of the heterogeneous nature of the intermediate zone (Maumee IIIb), each well will be designed according to the site-specific data collected at each well site. The slot size of the screen will be selected based on the following procedures. Split-spoon soil samples will be collected from the entire length of the aquifer. A grain size distribution analysis will be conducted on each split-spoon soil sample, with the results displayed on a cumulative percent retained graph. Once completed for each soil sample, the average of the curves will be calculated and displayed on an additional graph. The 50 percent retained value will then be recorded. Next, the grain-size distribution curves for sand packs available from the vendor will be acquired. The appropriate size sand pack will be the size whose 50 percent retained value is equal to five times the 50 percent retained size of the average cumulative curve of the soil samples. This sand pack should have a uniformity coefficient of two or less. The uniformity coefficient is calculated by dividing the 40 percent retained value by the 90 percent retained value. Consideration of not needing a sand pack will be given to natural formations having a uniformity coefficient of three or less.

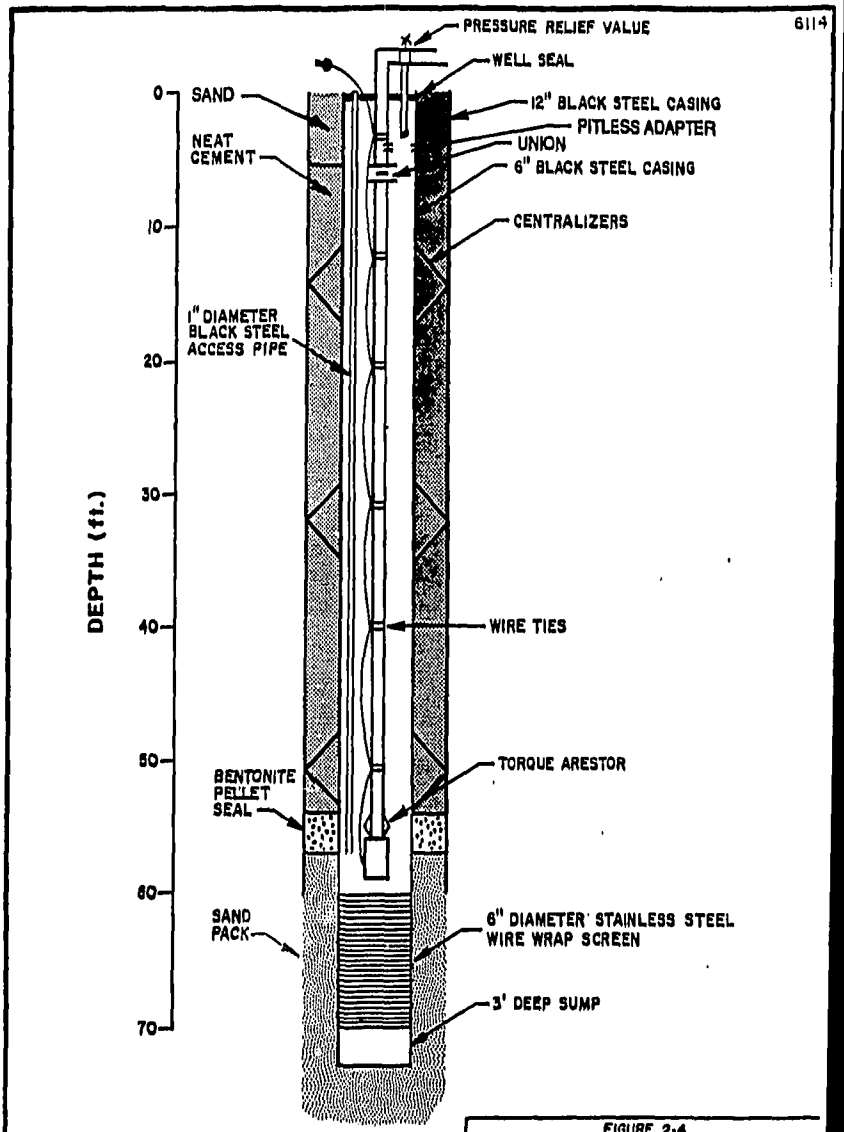
The slot size of the well screen will be determined from the same grain-size distribution curves of the sand pack selected. The slot size of the well screen will be determined by moving up the sand pack curve until the 80 percent cumulative percent retained value is reached. The corresponding grain size will then be determined and used as the slot size of the well screen. Next, the maximum transmitting capacity of the well screen selected will be calculated by multiplying the open area of the well screen by 0.31. The open area for a well screen will be provided by the manufacturer. The result is the number of gallons per minute one could expect from each lineal foot of screen assuming that the entrance velocity of the water is less than or equal to 0.01 feet per second. This result will be compared to design criteria. Finally, the entrance velocity of the water entering the well will

be calculated to ensure it is less than 0.01 feet per second. This is computed by dividing the well yield by the open area of the well screen. An entrance velocity of 0.01 feet per second is desirable to minimize the amount of well loss, prevent fine-grained sand from clogging the well screen, and minimize the amount of encrustation and corrosion to the well screen.

Each of the well screens described above will have a sufficient length of 6-inch diameter black steel riser welded to the well screen to reach the land surface.

When the final determined depth is reached for a given borehole, the well described above will be placed inside the borehole utilizing centralizers every 20 feet. Sand pack material, as specified above, will be slowly poured into the annulus until it extends three feet above the top of the well screen. Periodically during the placement of the sand pack, measuring tape will be lowered down the annulus to confirm the sand pack is reaching the desired location and that the sand is not breaching the annulus above the screen. Once the sand pack is confirmed to extend 3 feet above the top of the screen, bentonite pellets will be poured into the annulus to create a 3-foot thick seal. Again, periodically during the placement of the bentonite pellets a measuring tape will be lowered down the annulus to ensure the pellets have reached their desired location and that they have not breached the annulus at a higher location. The remainder of the annulus will be filled with a neat cement grout composed of 90 percent cement and 10 percent powdered bentonite by the tremie method. A diagram depicting these well construction details is provided as Figure 2-4.

2.2.3 Well Development. The well will initially be developed by pumping for a few hours to clean out any fine-grained sand immediately surrounding the well screen. The pump will be turned off for a few minutes periodically to surge water through the well screen. Later, a surge block (or double surge block) will be used in conjunction with well pumping to increase the effective radius of the well. This process will continue for approximately eight hours or if necessary will be continued until the on-site hydrogeologist is satisfied that the well has reached its maximum yield. The effectiveness of the well development will be monitored periodically by conducting specific capacity tests. This will be accomplished by pumping the well for a sufficient length of time for the water level in the well to stabilize. The pumping rate is then recorded along with the amount of drawdown observed. To calculate the



NOTE:
ACTUAL DEPTH TO BE DETERMINED BASED ON FIELD CONDITIONS.

FIGURE 2-4

EXTRACTION WELL CONSTRUCTION

LORD CORPORATION
SHOPE'S LANDFILL SITE
GIRARD TWP., ERIE CO., PENN.

ECKENFELDER INC. Nashville, Tennessee; Mahwah, New Jersey

AR000378

specific capacity of the well, the pumping rate (gallons per minute) is divided by the number of feet of observed drawdown. This provides an estimate of the number of gallons per minute the well can yield for every foot of drawdown. When the specific capacity of the well is relatively unchanged after a development event and the well yield is reasonable for a well its size, the well development will be terminated.

2.2.4 **Pump Installation.** After the well development is complete, a dedicated submersible pump will be installed in each well. The submersible pump will be capable of producing the required head to lift the water to the pilot-scale treatment plant. The extraction well located immediately downgradient of the landfill (IPE) will be fitted with an explosion-proof pump system. Each pump will be installed 3 feet above the top of the well screen to maximize the available drawdown of the water level. The pump will be fitted with 1-1/4-inch black steel discharge pipe. A torque arrestor will be assembled at the junction of the discharge pipe and the pump to prevent the pump from unscrewing from the discharge pipe. Wire ties will be used every 20 feet to tie the electrical cord to the discharge piping.

A pressure relief valve will be connected to the discharge pipe inside the well head to direct water back into the well if pressure builds up above the allowable pressure of the components in the discharge piping.

Pumps will have on/off switches located in the groundwater treatability study pilot plant as well as at the pumps.

A 1-inch diameter, black steel pipe will be assembled and lowered down the annulus of the 6-inch diameter well to provide access for water level measurements. This access pipe will be secured to a surface seal which will prevent foreign material from entering the well.

2.3 Decontamination

Drilling equipment which comes in contact with the soil will be decontaminated by steam cleaning prior to use in each borehole.

2.4 Groundwater Conveyance To The Pilot Plant

Groundwater will be temporarily conveyed to the groundwater treatability pilot plant from the wells with polyethylene piping, placed on the ground and secured with sand bags. Water from the two well points will be conveyed by either a centrifugal pump or a common header force main. Water from each of the other two extraction wells will be conveyed by individual force mains. Pressure relief values will be installed in the piping routes to prevent excessive pressures from building up within the systems.

APPENDIX D

WETLANDS DELINEATION PLAN
LORD-SHOPE LANDFILL SUPERFUND SITE

APPENDIX D

WETLANDS DELINEATION PLAN
LORD-SHOPE LANDFILL SUPERFUND SITE

The Lord-Shope Landfill Superfund site within the range of influence of groundwater extraction and other response activities will be evaluated for presence of wetlands and if identified, the areas will be delineated. The study will be performed in accordance with the Federal Manual for Identifying and Delineating Jurisdictional Wetlands, January 1989, (1991 revisions inclusive, Draft for Public Comment dated July 10, 1991). Pennsylvania's new wetlands and encroachment requirements will also be considered. In addition to wetlands delineation, if present, appropriate transition zones will be determined up to 50 lineal feet from identified boundaries.

In order to clearly describe the work, "wetlands" that are regulated or jurisdictional must be defined. The White House Office of Management and Budget has approved the revisions to the 1989 Wetlands Manual and a draft for public comment was released on July 10, 1991. An amendment to the energy and water development appropriations bill (HR 2437, July 10, 1991) will not permit the Corps to use the 1989 Manual after October 1, 1991. The major emphasis in the revised Manual increases the burden of proof required to identify and delineate a wetland by further clarifying the manner in which field indicators are used to indicate whether the three criteria (wetland hydrology, hydrophytic vegetation, and hydric soils) are met" (USEPA, draft revisions, July 10, 1991). Perhaps more importantly, with exception of special cases like prairie potholes, all three wetlands criteria must be present for an area to be designated a wetland.

The revisions emphasize that hydric soils alone would not establish presence of a wetland. USEPA further noted that many people misinterpreted the 1989 Manual by relying on the hydric soil criteria alone to delineate wetlands. Therefore, at the Lord-Shope Landfill Superfund Site all three criteria noted above must be present for determining presence of a wetland area.

The objectives of the wetlands delineation Scope of Work include:

- Identification of wetlands, if present
- Delineation of wetlands
- Determination of a 50 lineal foot transition zone around any wetlands segments
- Classify any delineated wetlands as to whether they are emergent, scrub shrub, or forested.

Areas of the study will include:

- All areas potentially impacted by groundwater withdrawal to a depth greater than 18 inches.
- Areas to be passed over by equipment during construction
- Areas within the corridor of the groundwater pipeline collection system
- Areas within the groundwater treatment plant and associated facilities
- Area along and 50 feet either side of the discharge pipe to the unnamed stream
- All wetland areas are to be bound by markers

Other objectives of the study will include:

- Determination if any former or prior converted wetlands are included in the project area
- Boundary markers will be used to locate wetlands on an area topo sheet and identify a 50 foot transition zone.

ECKENFELDER INC.'s groundwater model output and historical water level data will be used to determine impact of groundwater withdrawal relative to areas of defined wetlands to a depth of 18 inches. These data can be used to identify areas to be impacted or possibly avoided during construction of the groundwater collection and treatment system and to minimize indirect construction-related impacts to any jurisdictional wetlands. Although impacts of withdrawal on defined wetlands hydrology may be unavoidable, the area affected can be determined for any ultimate mitigation or for returning any directly impacted wetlands to pre-remedial action grade at some point in time following remediation.

Attachment A, the Wetlands Delineation Data Form used by the Corps, contains a summary of data needed and the decision track for determining presence of a wetland. This form will be used to collect data for each station selected. All parameters will be evaluated at the field site. On site evaluations will be conducted by highly experienced aquatic ecological and wetlands scientists.

Schedule of Work

Depending on the timing of the workplan approval, the site evaluation can be conducted in May 1992 or at the very earliest three weeks before the average date of the last killing frost.

ATTACHMENT A

WE ANDS DELINEATION
DATA FORM
ROUTINE ON SITE DETERMINATION METHOD[1]

Field Investigator(s): _____ Date: _____
Project/Site: _____ State: ____ County _____
Applicant/Owner: _____ Plant: Community/Name: _____
Note: If a more detailed site description is necessary, use the back of data form or a field notebook.

Do normal environmental conditions exist at the plant community?
Yes ____ No ____ (If no, explain on back)
Has the vegetation, soils, and/or hydrology been significantly disturbed:
Yes ____ No ____ (If yes, explain on back)

VEGETATION

Dominant Plant Species	Indic. Stat.	Strat.	Dominant Plant Species	Indic. Stat.	Strat.
1.			11.		
2.			12.		
3.			13.		
4.			14.		
5.			15.		
6.			16.		
7.			17.		
8.			18.		
9.			19.		
10.			20.		

Percent of dominant species that are OBL, FACW, and/or FAC ____
Is the hydrophytic vegetation criterion met? Yes ____ No ____
Rationale: _____

SOILS

Series/phase: _____ Subgroup: _____
Is the soil on the hydric soils list? Yes ____ No ____ Undetermined ____
Is the soil a Histosol? Yes ___ No ___ Histic epipedon present? Yes ___ No ___
Is the soil: Mottled? Yes ___ No ___ Gleyed? Yes ___ No ___
Matrix Color: _____ Mottle Colors: _____
Other hydric soil indicators: _____
Is the hydric soil criterion met? Yes ____ No ____
Rationale: _____

HYDROLOGY

Is the ground surface inundated? Yes ____ No ____ Surface Water Depth: ____
Is the soil saturated? Yes ____ No ____
Depth to free-standing water in pit/soil probe hole: _____
List other field evidence of surface inundation or soil saturation: _____
Is the wetland hydrology criterion met? Yes ____ No ____
Rationale: _____

JURISDICTIONAL DETERMINATION AND RATIONALE

Is the plant community a wetland? Yes ____ No ____
Rationale for jurisdictional decision: _____

[1]This data form can be used for the Hydric Soil Assessment Procedure and the Plant Community Assessment Procedure.